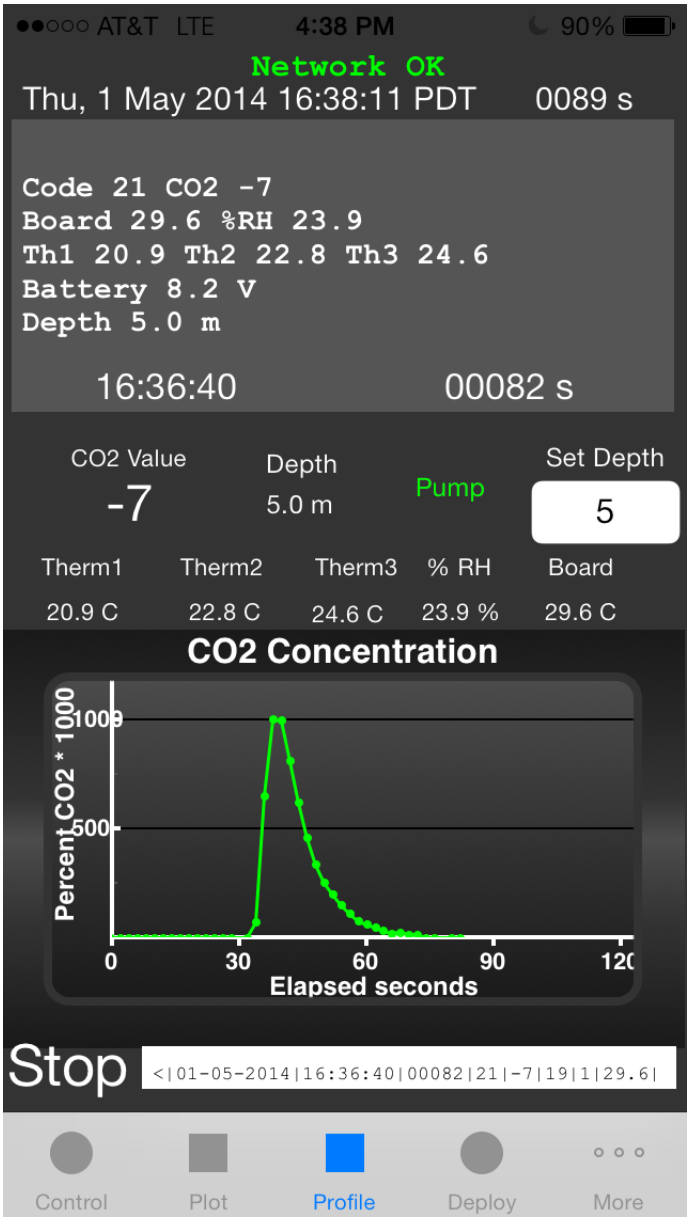
iOS App for Onsite Control of LBNL Isco/CO2 Modules

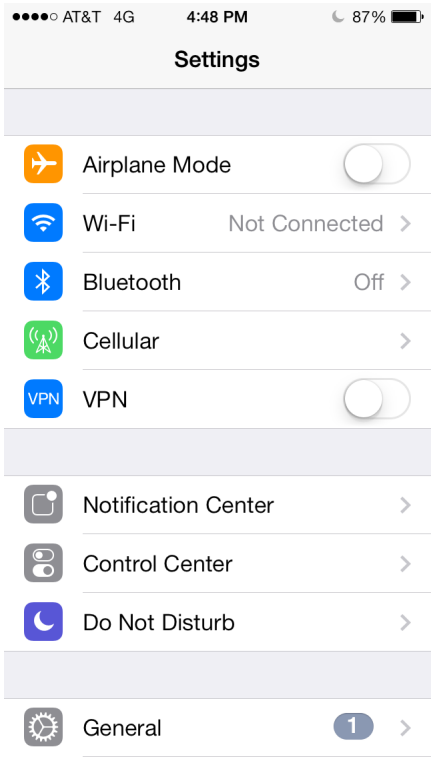
AngeloCO2 Rev 2.0 May 2014

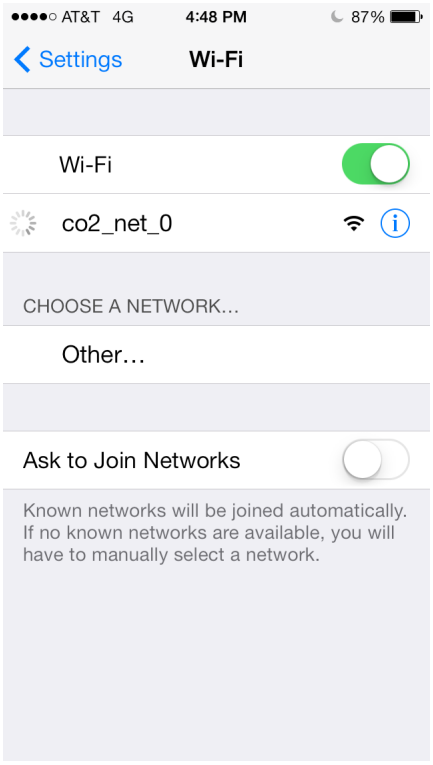
Contact: Todd Wood
Lawrence Berkeley National Lab
(510) 486-4104 tjwood@lbl.gov



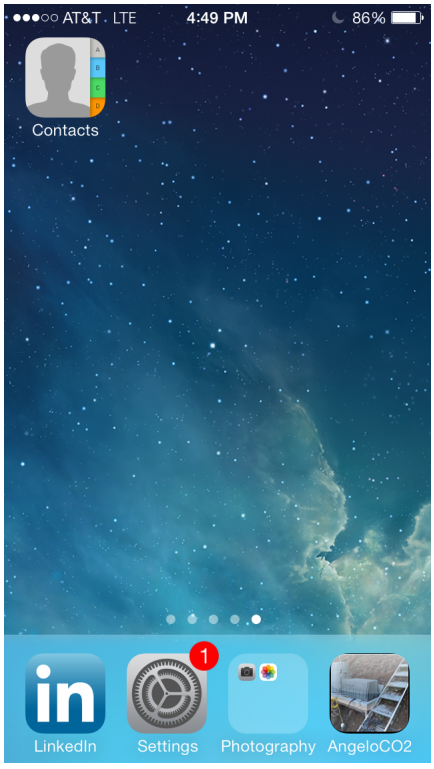
Note: This app is not in the Apple Store at this time. For access, please email the Device ID of your iOS device to me at tjwood@lbl.gov and I will respond with an app file to be loaded onto your device through iTunes. Once all controllers in the field are upgraded to wireless I will make the App available through the Apple app store.

On iOS devie, use Settings to connect to WiFi SSID co2_net_0

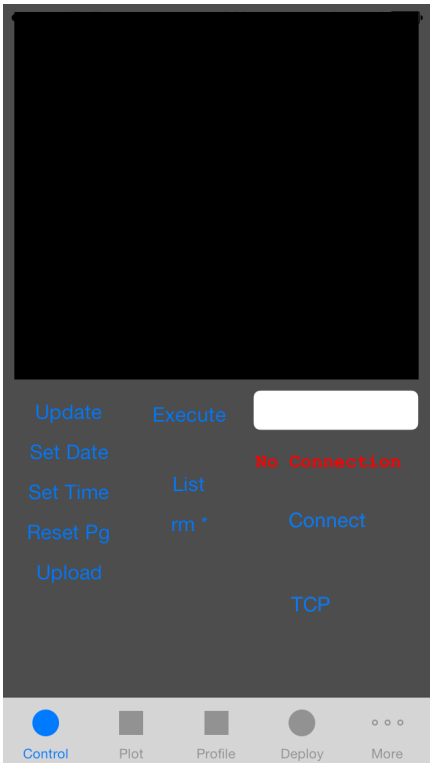




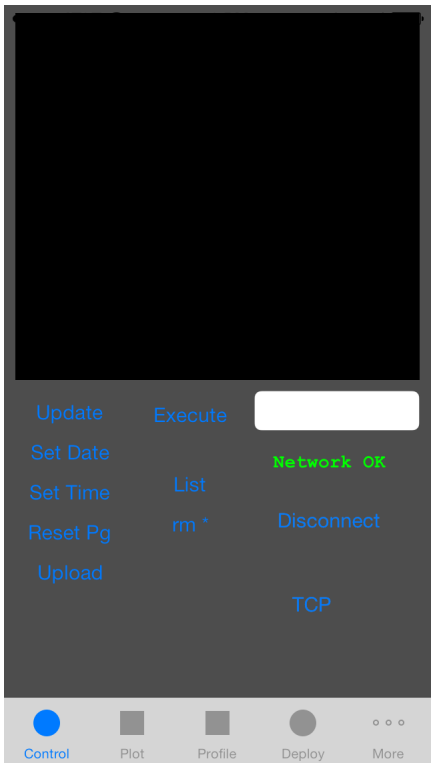
Start the AngeloCO2 App

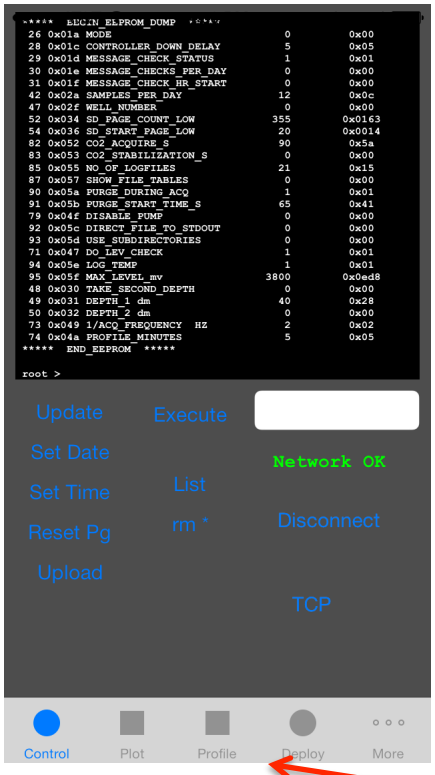


Opening screen. Tap 'Connect'



If connection is OK you will get Green ‘Network Ok’ message.





There are 3 connection options:
1) wired serial (to be deprecated)
2) Wifi
3) Bluetooth LE

Tapping TCP, BT, Serial will cycle through these modes

Currently not all deployed controllers have all 3 options installed. All except Well1 have Wifi so that is the default choice. Well 1 requires wired serial. I will update the hardware with at Well 1 on the next site visit so that it will use Wifi and BT as well. At that point wired option will be removed from the App. (the wired mode used a private library which means it cannot be placed in the App Store)

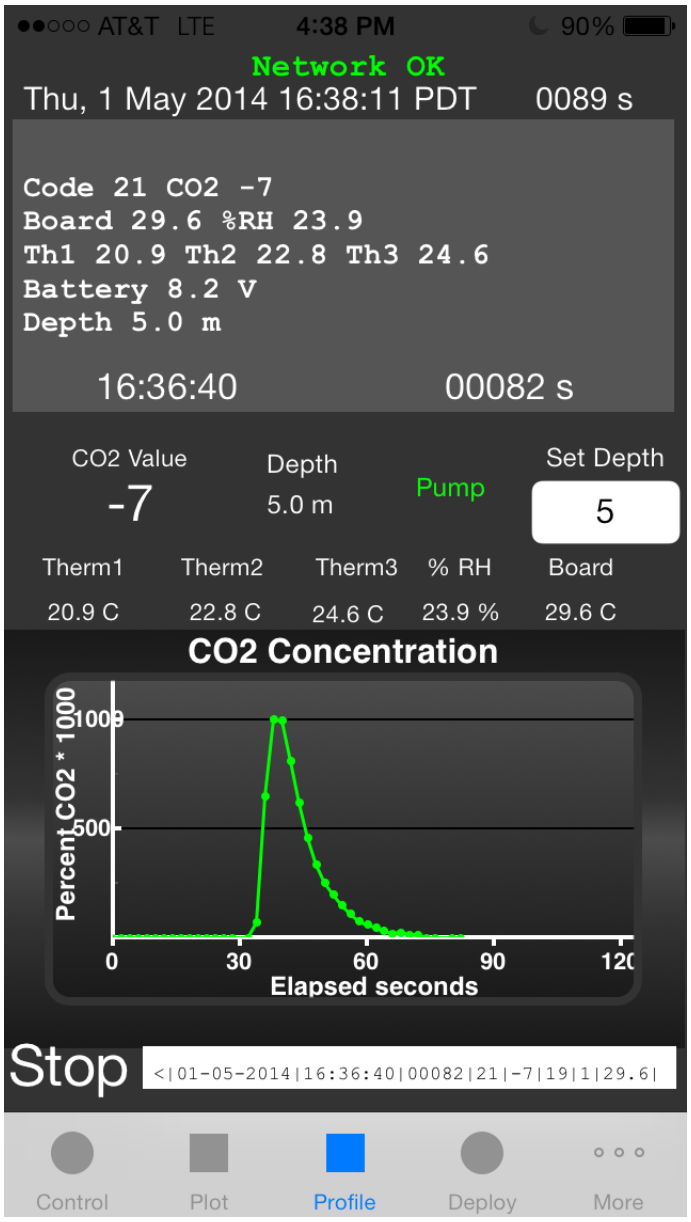
Tap Update for a list of Settings. If settings are not displayed then Tap a 2nd time. These are the settings stored in the microcontroller, NOT on the IOS device. Change settings as follows:
Tap the Text box and in the box type:
e Addrress Value
e.g.
e 74 5
to set address 74 to a value of 5.

Hit Return to dismiss the keyboard, then Tap Execute to issue the command.

List and rm * will show and clear files stored on the SD Card of the Box, not the iOS device. Clear the files before Profiling.

Set Date and Set Time sets the controller to the same Time/Date as the iOS device.

Once you have connection to the controller, tap the Profile tab.



Set current Depth in meters by typing values into the text box. This can be updated during the profile. The pump will start when the profile starts (or not, based on eeprom setting DISABLE_PUMP). The pump can be manually Started/Stopped by tapping 'Pump'. Green indicates it is running, Red indicated the pump is not running.

To start profiling tap 'Start' and text should begin scrolling on the screen. The profile will run indefinitely until Stop is tapped. A temporary file is created called tYYYMMDD_HHMMSS.pfl
If something happens during profile and the app or board crashes, this file will be available to recover data. If all goes well and profile is terminated by tapping Stop, a data file YYYYMMDD_HHMMSS.pfl is created and the temp file deleted.

Once a profile is running, values will be updated.

CO2 Value = raw output CO2%*1000
Therm1 = In well thermistor at intake
Therm2 = a thermistor in cable
Therm3 = a thermistor in the box
%RH = Rel Humidity of gas prior to exhaust
Board = Digital temp chip in center of board
Depth = depth in m input by user (no sensor)

The iOS device's clock and s elapsed since beginning the profile are displayed across the top. At the bottom of the status display is the clock from the board and elapsed time since profiling began. This excludes initial readings of battery voltage, etc so is ~ 10 s less than the iOS elapsed counter. This clock and all settings only update when a new valid reading is taken.

If Stop is tapped and for some reason the button turns to Start but the profile continues to run (i.e. command not received over wireless) the user can type 'stop' in the text box and hot return.

Data files:

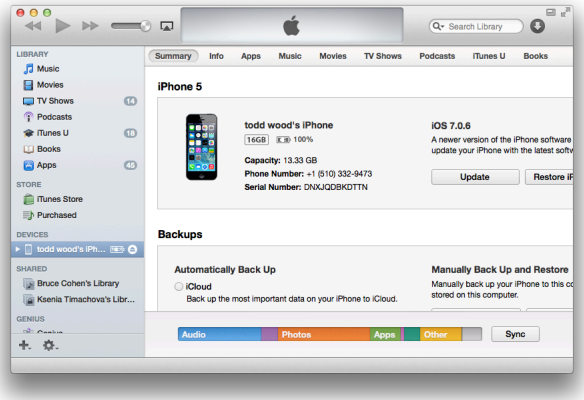
The profile data is stored in 2 places:

1) one the board's SD Card
2) on the iOS device

The board's filesystem holds only 32 files then the oldest files are overwritten. The number of files on the iOS device are only limited by available memory.

To get files off of the iOS device:

1) plug into computer with the Apple usb cable and start iTunes
2) on the left hand side bar under 'Devices' click on your iOS device
3) click on Apps at the top of the screen
4) scroll down to Fie Sharing and Click AngeloCO2
5) click AngeloCO2Data and then 'Save to ..'
6) Note this will save the entire directory so click on New Folder to create a place to save the directory. Otherwise you may overwrite previous data.



Example profile data file:

./profile

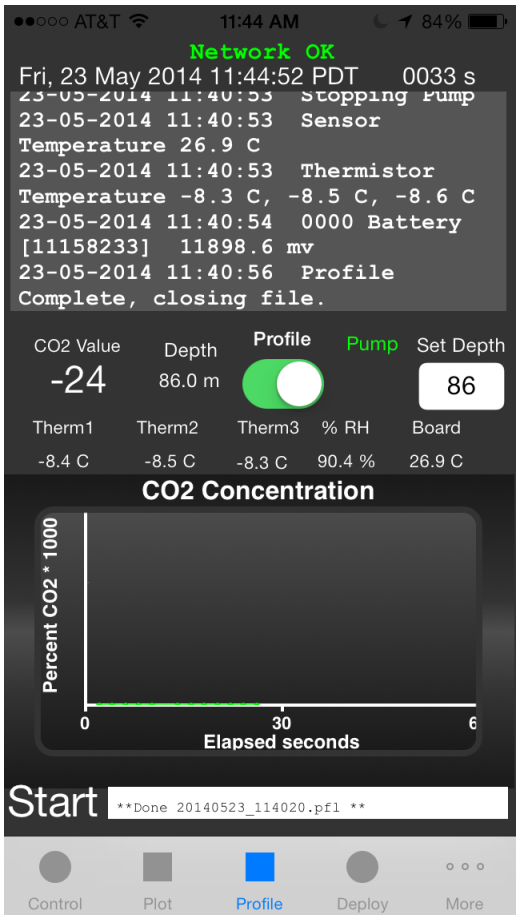
Sensor Location Well 00 Depth 4.0 m
CO2 Sensor Serial No 030bd3b7
01-05-2014 16:20:47 Sensor wakeup
01-05-2014 16:20:47 Delay for 00 s
01-05-2014 16:20:47 Sensor Temperature 31.6 C
01-05-2014 16:20:47 Thermistor Temperature 20.8 C, 23.0 C, 28.2 C
01-05-2014 16:20:48 Thermistor Temperature 20.8 C, 22.4 C, 28.3 C
01-05-2014 16:20:48 Thermistor Temperature 21.2 C, 22.8 C, 28.1 C
01-05-2014 16:20:49 0000 Battery [7936549]   8547.8 mv
01-05-2014 16:20:50 Starting Pump
01-05-2014 16:20:50 Sample frequency 1 sample every 2 s.
01-05-2014 16:20:50 Air purge settings: State 1 Purge Start 65
<|01-05-2014|16:20:52|00000|21|-12|14|1|31.6|20.6|22.9|28.2|27.8|26.6|4.0|8.5|1|>
<|01-05-2014|16:20:54|00002|21|-13|13|1|31.6|20.9|22.9|28.3|27.9|25.1|4.0|8.5|1|>
<|01-05-2014|16:20:56|00004|ff|-1|ff|1|31.6|20.8|22.6|28.3|27.9|24.4|4.0|8.5|1|>
./DEPTH 6
<|01-05-2014|16:20:58|00006|21|-16|10|1|31.6|20.5|22.8|28.3|27.9|23.5|4.0|8.5|1|>
<|01-05-2014|16:21:00|00008|21|-15|11|1|31.6|20.4|22.9|28.2|27.9|23.4|6.0|8.5|1|>
<|01-05-2014|16:21:02|00010|21|-13|13|1|31.6|21.1|22.5|28.1|27.9|23.3|6.0|8.5|1|>
<|01-05-2014|16:21:04|00012|21|-15|11|1|31.7|20.9|22.8|28.4|28.1|23.2|6.0|8.5|1|>
<|01-05-2014|16:21:06|00014|21|-13|13|1|31.7|20.6|22.9|28.1|27.9|23.2|6.0|8.5|1|>
<|01-05-2014|16:21:08|00016|21|-13|13|1|31.7|20.5|22.8|28.4|27.9|23.0|6.0|8.5|1|>
<|01-05-2014|16:21:10|00018|21|-14|12|1|31.7|20.9|22.9|28.4|27.9|23.0|6.0|8.5|1|>
<|01-05-2014|16:21:12|00020|21|-15|11|1|31.7|20.6|22.9|28.2|27.9|22.9|6.0|8.5|1|>
<|01-05-2014|16:21:14|00022|21|-15|11|1|31.7|20.6|22.8|28.3|27.9|23.0|6.0|8.5|1|>
<|01-05-2014|16:21:16|00024|21|-16|10|1|31.8|20.6|23.0|28.7|27.9|23.1|6.0|8.5|1|>
<|01-05-2014|16:21:18|00026|ff|-1|ff|1|31.7|21.0|22.9|28.6|27.9|22.9|6.0|8.4|1|>

.... Data omitted ----

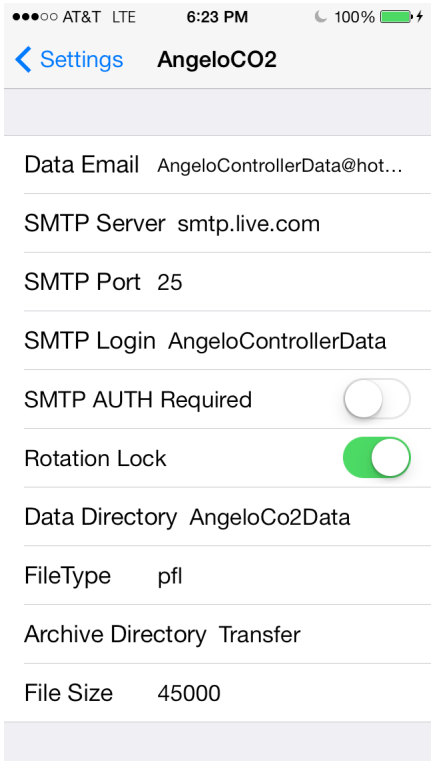
<|01-05-2014|16:29:14|00496|21|-8|18|1|30.5|20.9|22.9|24.6|28.1|23.2|67.0|8.4|0|>
<|01-05-2014|16:29:16|00498|21|-8|18|1|30.5|20.8|23.2|24.6|28.0|23.2|67.0|8.4|0|>
<|01-05-2014|16:29:18|00500|21|-8|18|1|30.5|20.9|22.7|24.7|28.1|23.1|67.0|8.4|0|>
<|01-05-2014|16:29:22|00502|21|-9|17|1|30.5|20.8|22.8|24.7|28.0|23.3|67.0|8.4|0|>
./STOP
<|01-05-2014|16:29:24|00504|21|-9|17|1|30.5|20.7|23.0|24.5|28.0|23.3|67.0|8.4|0|>
01-05-2014 16:29:25 Acquisition Stopped by USER !!
01-05-2014 16:29:25 Stopping Pump
01-05-2014 16:29:25 Sensor Temperature 30.5 C
01-05-2014 16:29:25 Thermistor Temperature 20.9 C, 22.9 C, 25.2 C
01-05-2014 16:29:26 0000 Battery [7829821]   8436.8 mv
01-05-2014 16:29:27 Profile Complete, closing file.
**Done 20140501_162046.pfl **

Update:

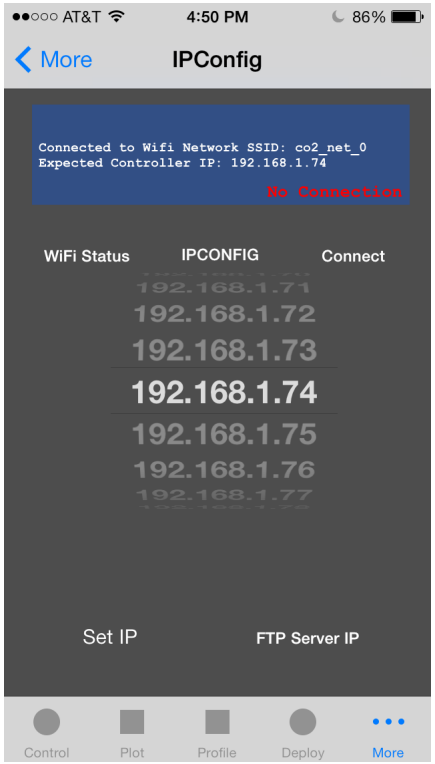
Added a switch to select between Manual Profile mode and automated sample mode. Once a profile is started, the switch disappears and is replaced by a button labeled 'Record'. Tapping 'Record' will save the current reading to a summary file with a .rec extension.. The full data file still exits with a .pfl extension.



Profile Summary
3 Records
<|23-05-2014|11:29:55|00012|21|-21|0b|1|26.7|-8.5|-8.5|-8.7|76.0|104.9|12.0|11.8|1|>
<|23-05-2014|11:30:11|00028|21|-23|09|1|26.7|-8.4|-8.4|-8.6|55.0|76.2|11.0|11.8|1|>
<|23-05-2014|11:30:33|00050|21|-22|0a|1|26.7|-8.3|-8.4|-8.7|77.6|63.0|8.0|11.8|1|>



These are the general App settings which must be entered from the iOS Settings App. Scroll down to AngeloCO2 and enter settings. The Data Directory specifies where on the device the data files will be stored and can be changed. Other settings should be as listed. 'Data Email' and other SMTP settings can be left blank but 'SMTP AUTH Requited' must be OFF.



The WIFI connection and SSID selection of co2_net_0 must be made from the iOS Settings App but the current selection can be viewed from the IPConfig screen. Currently all controllers connect on IP 192.168.1.74 so it should not be necessary to change this although it can be changed from the selection wheel. Tapping 'Set IP' and the 'WiFi Status' will show the new settings. If SSID is null return to iOS Settings App and select co2_net_0 from the WiFi setting. If IP is not 192.168.1.74 select correct setting from the wheel.

EEPROM Settings For Profiling Mode

```
*****  BEGIN_EEPROM_DUMP  *****
 26 0x01a MODE                          0          0x00
 28 0x01c CONTROLLER_DOWN_DELAY         5          0x05
 29 0x01d MESSAGE_CHECK_STATUS          1          0x01
 30 0x01e MESSAGE_CHECKS_PER_DAY        0          0x00
 31 0x01f MESSAGE_CHECK_HR_START        0          0x00
 42 0x02a SAMPLES_PER_DAY              12          0x0c
 47 0x02f WELL_NUMBER                   0          0x00
 52 0x034 SD_PAGE_COUNT_LOW           355        0x0163
 54 0x036 SD_START_PAGE_LOW            20        0x0014
 82 0x052 CO2_ACQUIRE_S                90          0x5a
 83 0x053 CO2_STABILIZATION_S           0          0x00
 85 0x055 NO_OF_LOGFILES               21          0x15
 87 0x057 SHOW_FILE_TABLES              0          0x00
 90 0x05a PURGE_DURING_ACQ              1          0x01
 91 0x05b PURGE_START_TIME_S           65          0x41
 79 0x04f DISABLE_PUMP                  0          0x00
 92 0x05c DIRECT_FILE_TO_STDOUT         0          0x00
 93 0x05d USE_SUBDIRECTORIES            0          0x00
 71 0x047 DO_LEV_CHECK                  1          0x01
 94 0x05e LOG_TEMP                      1          0x01
 95 0x05f MAX_LEVEL_mv               3800        0x0ed8
 48 0x030 TAKE_SECOND_DEPTH             0          0x00
 49 0x031 DEPTH_1 dm                   40          0x28
 50 0x032 DEPTH_2 dm                    0          0x00
 73 0x049 1/ACQ_FREQUENCY  HZ           2          0x02
 74 0x04a PROFILE_MINUTES               5          0x05
*****  END_EEPROM  *****

root >
```

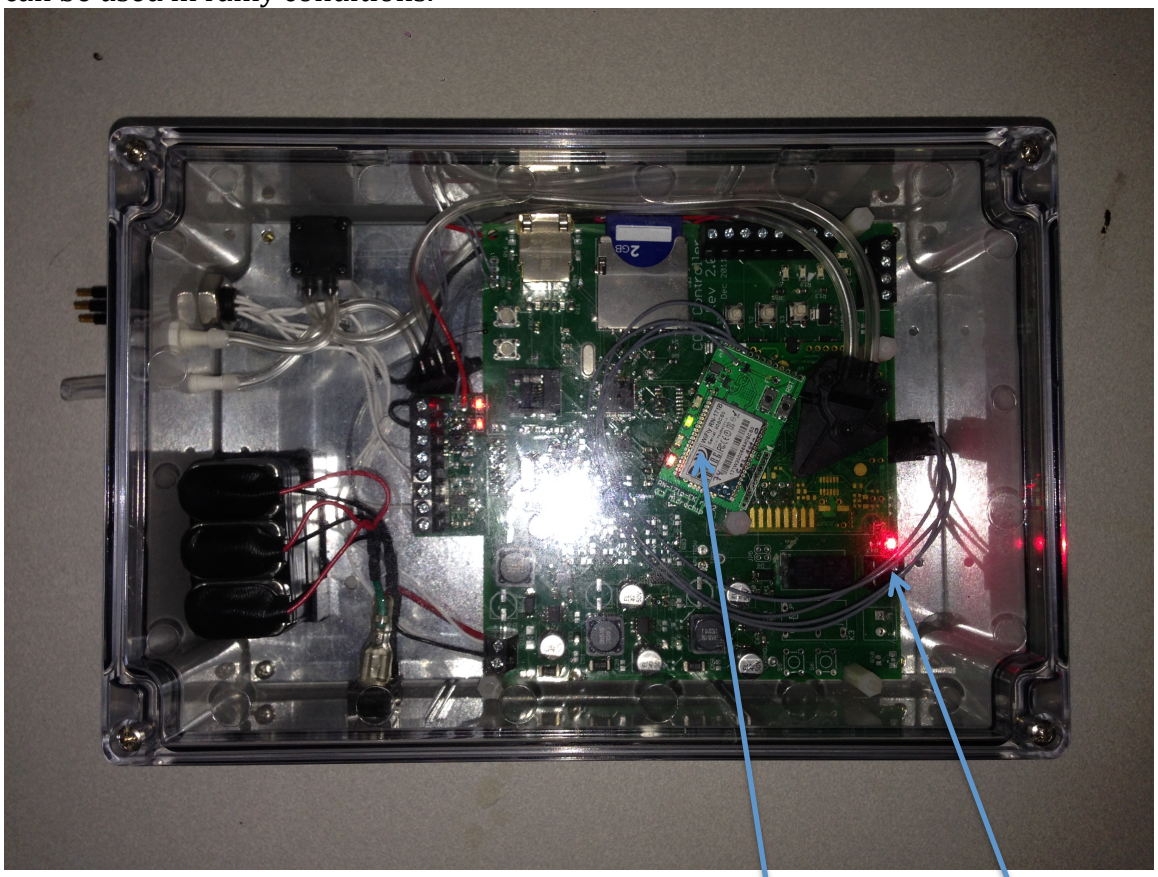
For Profiling mode, only the following settings need to be changed:

Address	Data Field	Description
47	WELL_NUMBER	enter well number being profiled
49	DEPTH_1 dm	sets initial depth in dm. 40 = 4.0 m
79	DISABLE_PUMP	set to 0 to run pump, >0 disable pump
73	1/ACQ_FREQ…	seconds between points. Set 5 for 0.2 Hz

e.g. to update WELL_NUMBER to Well 10:

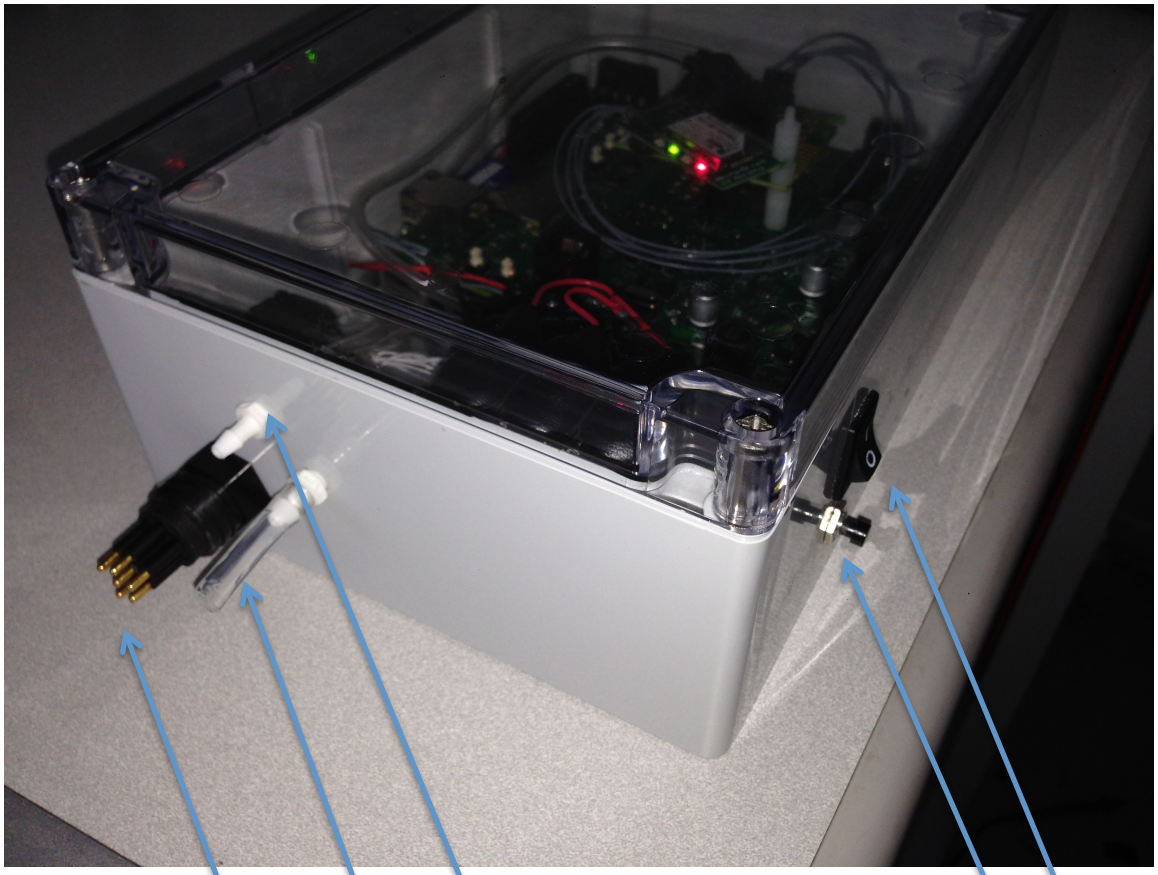
e 47 10

Pictured below is the Portable CO2 profiler which is used to manually profile wells while on site (as opposed to the permanent installations in various wells). In the latest version, I have added a new comm module which allows both wifi and Bluetooth LE connection from iOS. The enclosure is NEMA4X so is watertight and can be used in rainy conditions.



Solid green when Wifi connection established

Should Blink when not profiling


reset
exhaust
inlet
Power
Thermistor / ext power